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Revision of Metrology Test Fee Schedules

Title 15—COMMERCE AND FOREIGN TRADE

Chapter II—National Bureau of Standards, Department of Commerce

SUBCHAPTER A—TEST FEE SCHEDULES

PART 202—METROLOGY

Pursuant to authority contained in 15 U.S.C. 275a the following revision of Part 202, Subchapter A, Chapter II, Title 15 of the Code of Federal Regulations previously issued (29 F.R. 18032, December 18, 1964) is made to correct and delete certain schedules and to reprint the entire part to read as follows.

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AUTHORITY: The provisions of this Part 202 issued under sec. 9, 31 Stat. 1450, as amended; 15 U.S.C. 277. Interprets or applies sec. 7, 70 Stat. 959; 15 U.S.C. 275a.

PHOTOMETRY AND COLORIMETRY

§ 202.103 Miscellaneous photometric measurements and tests.

Item	Description	Fee
202.103a	Determination of luminous transmittance of neutral or colored filter, one sample	$65.00
202.103z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.104 Rating of incandescent electric lamps.

Item	Description	Fee
	Rating tests on lamps. These are routine photometric rating tests of the type made initially on lamps to be life-tested, the same standards and equipment being used. The purpose of these tests is to afford a quick check of the photometric values assigned to lamps by various lamp life-test laboratories.	
202.104a	Rating of incandescent lamps up to 1,000 w, one lamp	$27.00
202.104b	Same, each additional lamp of same size and type	7.00
202.104z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.105 Spectrophotometric standards.

Note on item a: Transmittances of these disks at wavelengths from 365 to 390 nm (nanometer, 10^{-9} meter) and from 750 to 1,000 nm will also be determined on request in accordance with item c of fee schedule 202.105. Values will be obtained for a temperature of 25° C. The effect of change of temperature has not been determined for these glasses outside the range from 390 to 750 nm. It is known, however, that for all four types of glass the temperature effects are very small from 750 to 1,000 nm, probably negligible for the usual room-temperature variations. On the other hand, temperature effects are always large for these kinds of glass when the transmittance as a function of wavelength is decreasing rapidly towards shorter wavelengths, so that increasingly large temperature effects may be expected for these filters in the ultraviolet.

Note on items j and k: In the General Electric recording spectrophotometer the design is such that the radiant energy is incident in a slightly diverging beam whose axis is at 6° to the perpendicular to the surface. The specular component of the reflected energy is thus diverted away from the entrance aperture towards a port on the side. This port may be filled with MgO or with a black material, so that the specular component may be respectively "included" in, or (for plane surfaces) "excluded" from, the measurements. This is covered in items j and k.

Only one Vitrolite working standard is needed for the measurement of spectral directional reflectance on the General Electric recording spectrophotometer. This calibrated Vitrolite standard and the samples to be tested are in turn placed at the sample aperture of the integrating sphere, and any highly reflecting substance such as MgO or $MgCO_3$ may be used at the comparison aperture provided the material to be tested does not reflect more than the comparison material. The directional reflectances of the test samples relative to freshly prepared MgO are then obtained by multiplying (at the respective corrected wavelength) the values for these samples read from the curve sheet, by the ratios of (a) the standard Vitrolite values reported to (b) the values for the Vitrolite read from the curve sheet.

Item	Description	Fee
	Standards of spectral transmittance for checking the photometric scale of spectrophotometers; these consist of polished disks of glass, 2 to 3 mm thick and 30 mm in diameter, designated as cobalt blue, copper green, carbon yellow, and selenium orange (copper green filter also available in 25 mm square size); report includes (1) values of transmittance at 25°C at certain wavelengths from 390 to 750 nm, (2) estimated uncertainty of each value, (3) effect of temperature change on transmittance at each wavelength:	
202.105a	Each disk	$120.00
	Transmittance, 365 to 1,000 nm for standardization purposes. Samples submitted must be in good optical condition. Measurements at room temperature. (If the sample is a disk 29.7±0.2 mm in diameter, the measurements can be made at a specified temperature):	
202.105b	One sample at one wavelength	47.00
202.105c	Each additional wavelength on the same sample	11.00
	Didymium glass standards for checking the wavelength calibration of General Electric recording spectrophotometers; these consist of Corning 5120 glass, 2×2 in., 3.0 mm thick, polished; report includes table of wavelengths of minimum transmittance:	
202.105d	400 to 750 nm, 10 nm slits, each standard	60.00
202.105e	730 to 1,080 nm, 20 nm slits, each standard	60.00
202.105f	For two calibrations on the same glass (items 202.105d and 202.105e), each standard	92.00
	Holmium oxide glass standards for checking the ultraviolet and visible wavelength calibrations of recording spectrophotometers with slit width less than 2 nm; these consist of Corning 3130 glass 2×2 in., 2.5 mm thick, polished; report includes table of wavelengths of minimum transmittance:	
202.105g	240 to 370 nm, each standard	105.00
202.105h	360 to 650 nm, each standard	105.00
202.105i	For two calibrations on the same glass (items 202.105g and 202.105h), each standard	130.00
	Working standards of spectral directional reflectance for use on General Electric recording spectrophotometers with 6° from perpendicular irradiation and diffuse reception; standards consist of white structural Vitrolite glass, 4 x 4 in., 5/16 in. thick; report includes table of spectral directional reflectances relative to freshly prepared MgO at every 10 nm:	
202.105j	400 to 750 nm, specular component both included and excluded (on same glass), 10 nm slits, each standard	130.00
202.105k	730 to 1,080 nm, specular component both included and excluded (on same glass), 20 nm slits, each standard	130.00
	Working standards of spectral directional reflectance for use on the Beckman Model DU quartz spectrophotometer with nearly perpendicular irradiation and approximately 45° circular reception; standards consist of white structural Vitrolite, glass 1½ x 2 in., 5/16 in thick; report includes table of spectral reflectances relative to freshly prepared MgO at every 10 nm:	
202.105l	380 to 770 nm, each standard	76.00
202.105m	750 to 1,000 nm, each standard	76.00
202.105n	350 to 1,000 nm, each standard	140.00
202.105z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.106 Spectrophotometric measurements.

The tests described in this section are primarily made for informational purposes, and samples so tested should not be accepted as "standards." All measurements are made at room temperatures. For various types of spectrophotometric standards, see § 202.105.

Item	Description	Fee
	Spectral transmittance, 210 to 1,000 nm:	
202.106a	One sample at one wavelength	$51.00
202.106b	Each additional wavelength on the same sample	6.00
202.106c	Each additional sample, each wavelength	6.00
	Spectral directional reflectance relative to MgO, normal irradiation and 45° circular reception, as obtained with the Beckman Model DU spectrophotometer, 254 to 1,000 nm:	
202.106d	One sample at one wavelength	51.00
202.106e	Each additional wavelength on the same sample	6.00
202.106f	Each additional sample, each wavelength	6.00
	Spectral transmittance or transmittancy curves obtained on General Electric recording spectrophotometer, including 100 percent and zero calibration curves and didymium glass curve for checking the wavelength calibration; report includes Ozalids of tracings:	
202.106g	Testing a single sample, 400 to 750 nm or 730 to 1,080 nm, with slits approximately 10 nm or 20 nm (respectively) of spectrum, either spectral range	69.00
202.106h	Each additional curve or each additional sample	11.00
202.106i	Same as 202.106g, but with both spectral ranges, 400 to 1,080 nm	95.00
202.106j	Each additional pair of curves or each additional sample	17.00
	Spectral directional reflectance curves obtained on General Electric recording spectrophotometer, including (1) Vitrolite calibration curve for correcting values relative to fresh MgO as 100 percent, (2) zero curve, (3) didymium glass curve for checking the wavelength calibration; report includes Ozalids of tracings:	
202.106k	One sample, 400 to 750 nm, or 730 to 1,080 nm, with slits approximately 10 nm or 20 nm (respectively) of spectrum, with specular component of reflected energy included or excluded, either spectral range, and either condition of specular reflection	69.00
202.106l	Each additional curve or each additional sample, each curve	11.00
202.106m	Same as 202.106k, but both spectral ranges, 400 to 1,080 nm	95.00
202.106n	Each additional pair of curves or each additional sample	17.00
202.106o	Reduction of data obtained as in 202.106g to 202.106n, giving table of values of transmittance, transmittancy, or directional reflectance relative to MgO for every 10 nm, for each curve	27.00
202.106z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.107 Colorimetry.

Item	Description	Fee
202.107a	Computing chromaticity coordinates and luminous directional reflectance or transmittance from spectrophotometric data for certain specified light sources, per source per sample	$15.00
202.107b	Computing luminous directional reflectance or transmittance from spectrophotometric data for certain specified light sources, per source per sample	11.00
202.107c	Determination of the Munsell renotation or book notation of a specimen from its daylight reflectance and chromaticity coordinates, each specimen	$9.00
202.107d	Conformity to chromaticity of standard, sample and standard illuminated normally by artificial daylight or by incandescent-lamp light, chromaticity difference expressed in terms of chromaticity coordinates on fundamental colorimetric coordinate system, one sample relative to a standard	37.00
202.107e	Each additional sample relative to the same standard	9.00
202.107f	Each additional sample relative to an additional standard	14.00
202.107g	Color temperature of 120-v, screw-base incandescent lamp, voltage for specified color temperature, current for neighboring voltage to check permanence, one color temperature, each lamp	40.00
202.107h	Color temperature standard supplied from stock, 100-w, medium-screw base or 500-w mogul-screw base projection type lamp, calibrated for 2,854° K, one lamp each	40.00
202.107i	Same, calibrated for any one other specified color temperature, one lamp each	43.00
202.107j	Each additional color temperature on the same lamp	15.00
202.107k	Equation giving any color temperature from 2,000 to 2,854° K, each lamp (fee includes cost of 500-w projection lamp)	105.00
202.107z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.108 Reflectometry.

Standards issued: Standards have been prepared for use in the measurement of daylight 45°0° directional reflectance (45° illumination, perpendicular viewing) of paints, paper, textiles, ceramic products, and other opaque materials. The standards are intended for use only with reflectometers designed to measure daylight 45°0° directional reflectance such as the multipurpose reflectometer developed at the Bureau. (Refer to J. Res. NBS 25, 581 (1940) RP1345.) Standards are available also for the tristimulus colorimetry of reflecting specimens of nearly the same spectral character. A detailed discussion of the method of photoelectric tristimulus, colorimetry, its capabilities and limitations, is contained in NBS Circular 429 (1942). The standards are calibrated in terms of the CIE tristimulus values *X*, *Y*, and *Z*. Information sheets describing these standards more fully are available on request.

Item	Description	Fee
	Standards issued	
	KB chromatic reflectance standards—calibrated for CIE tristimulus values X, Y, Z; 3 x 5 in. plaques in colors commonly called white, bath green, kitchen green, orchid, ivory, maize, bath blue, delphinium blue, royal blue, and red:	
202.108d	One KB chromatic standard	$52.00
202.108e	Each additional KB chromatic standard	21.00
202.108f	Set of 10 KB chromatic standards in above listed colors	165.00
	S chromatic reflectance standards—calibrated for CIE tristimulus values X, Y, Z: 4¼ in. sq with ¼-in., 90-deg. fold at each edge; in colors commonly called safety red, aviation orange, safety orange, school bus chrome, safety yellow, safety green, and safety blue:	
202.108g	One S chromatic standard	$52.00
202.108h	Each additional S chromatic standard	21.00
202.108i	Set of 7 S chromatic standards in above listed colors	155.00
202.108z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.109 Opacimetry.

Opacity of diffusing glass by contrast-ratio (ratio of luminous directional reflectance with black backing to that with white backing), illumination nearly perpendicular to surface of glass, reception of all reflected flux regardless of angle. Reflectance of white backing taken so as to accord with Bausch & Lomb type photoelectric opacimeter correctly adjusted to read contrast-ratio for thin samples with a white backing reflecting 0.915 relative MgO (TAPPI test method T425m–60). Diffusing glass rectangles, 5 x 12 cm, supplied by the Bureau.

Item	Description	Fee
202.109a	Each diffusing-glass opacity standard, opacity between 0.60 and 0.96 as desired	$43.00
202.109b	Set of four diffusing-glass opacity standards, opacities approximately equal to 0.72, 0.79, 0.86, and 0.93	130.00
202.109z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.111 Lovibond glasses.

Lovibond red glasses, determination of numeral on the AOCS scale established in 1961 by agreement with the Color Committee of the American Oil Chemists' Society, the value given being the effective value when the given red glass is used in combination with a 35-yellow glass, each glass to be engraved with the National Bureau of Standards test number and the numeral found for the glass.

Item	Description	Fee
202.111a	For testing a single red glass	$43.00
202.111b	For each additional red glass	17.00
202.111z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.112 Signal glass limit glasses and IPL calibrating filters.

(a) Railroad, highway (traffic), and aviation signal glasses for use as chromaticity limits or transmittance standards in accord with specifications approved by the cognizant technical association or government agency will be issued when available. The report of calibration includes chromaticity coordinates, luminous transmittance, or both as determined relative to national

standards filters for the specified color temperature or source.

(b) Instrument Panel Lighting (IPL) calibrating filters are available in 2-inch polished squares. They have the following designations (approximate chromaticity coordinates for color temperature, 2,854° K are shown below in parentheses): NBS 3056 (x=0.723, y=0.277), NBS 3114 (x=0.712, y=0.288), NBS 3215 (x=0.698, y=0.302), and NBS 3648 (x=0.667, y=0.333). The NBS 3215 filters define the pale limit for airplane red instrument panel lighting and are usually used in pairs; the other types of filters listed are for calibrating photometers used for measuring panel luminance.

Item	Description	Fee
202.112a	Signal limit glasses, each	$165.00
202.112b	IPL calibrating filters, calibrated for chromaticity coordinates and transmittance for 2,854° K	67.00
202.112c	Calibration for transmittance at an additional color temperature	12.00
202.112z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test	

§ 202.114 Radiometry.

Item	Description	Fee
202.114a	Eye protective glasses—calibration for transmittance of ultraviolet, visible, and total radiation	$65.00
202.114b	Calibration of radiant energy meter for energy of 2537 Å	65.00
202.114c	Measurement of radiant flux of 2537 Å, from germicidal or sterilamp	65.00
202.114h	Standard of spectral irradiance—quartz iodine lamp seasoned and calibrated for spectral irradiance from 0.25 to 2.5μ	380.00
202.114z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

Refractometry

§ 202.201 Optical instruments.

Item	Description	Fee
202.201z	Tests of telescopes, microscopes, binoculars, etc., to determine conformance to specifications of resolving power, aperture, alinement of axes, etc. Fees determined by the actual cost of the work.	

§ 202.202 Photographic objectives.

The following information is pertinent to the tests a to n in this schedule.

a. This test is applied to photographic objectives that are mounted in a lens barrel or shutter. A visual or a photographic method is used, depending upon the probable use of the lens. The back focal distance determines the lens position with respect to the focal plane for an airplane camera or other fixed-focus camera focused for an infinitely distant objective. The equivalent focal length determines the scale factor for the interpretation of aerial photographs.

b. This test is given to the photographic objectives that are to be used in precision copying cameras. The information is used in calibrating the camera scales that enable the user to obtain the proper settings of lens, object plane, and image plane for any desired magnification without visual focusing.

c, d. This test includes the information obtained in 202.202b, together with information on distortion. It is applied to photographic objectives that are to be used in precision copying cameras where the user wishes to be certain that the relative proportions of the image are not significantly different from those of the object. Since the distortion changes with magnification, it is advisable to specify a ratio for test that corresponds to the magnification most commonly used.

e. This is a general-purpose test to determine the suitability of a lens so far as its definition characteristics are concerned. It is performed photographically. In general, if a lens yields satisfactory results when subjected to this test, it is probable that no additional test for lateral aberration is necessary, and the lens will doubtless perform satisfactorily for either black-and-white or color photography.

f. This is a qualifying test for photographic objectives intended for use in airplane mapping cameras. It is a photographic test and the determinations are made for the plane of best average definition.

g, h. The f-number may be obtained by dividing the equivalent focal length of the lens by the diameter of the effective aperture. These tests are primarily of value in determining the accuracy of the geometric f-number markings at maximum aperture and at additional specified apertures.

i, j. This test is applied to photographic objectives mounted in cameras. As the test is a photographic one requiring a time exposure, it is necessary that the stop be open when the lens is submitted for test. This is a useful test for nonprecision type airplane cameras where the collimation index markers are located in a detachable magazine.

k. This test is applied to the platen of a precision aerial mapping camera, which is the surface against which the film is pressed during exposure. It is a test to determine conformance to specifications requiring that the platen shall not depart from a true plane by more than ±0.0005 in.

l. This test is applied to photographic objectives mounted in cameras. It gives the same information as test 202.202f except for back-focal distance. It is preferable that these lens characteristics be determined for the lens as mounted in a barrel shutter, but occasionally it is desirable to determine these quantities for the lens mounted in a camera. The shutter of the lens should be open when the camera is submitted for test.

m. This test is applied to a lens-camera combination that is to be used in photogrammetric mapping. It gives the departure of the principal point of auto-collimation from the center of collimation which is the intersection point of lines joining opposite pairs of collimation index markers. The equivalent focal length of the lens as mounted in the camera is determined in this test along with the radial asymmetric distortion which checks whether the lens has been properly mounted to yield best average definition throughout the image field.

This test cannot be performed on a camera having a detachable magazine which bears the collimation index markers. This is the preliminary test on a precision type camera to determine compliance with specification. If no provision has been made for ready adjustment of the collimation index markers and the 90° condition is not satisfied, the camera is returned to the firm or agency submitting the camera with recommendations regarding the necessary adjustments. If the 90° condition is satisfied, but no provision has been made for ready adjustment of the principal point with respect to the center of collimation, the camera is returned with recommendations regarding the necessary adjustments.

n. If no provision has been made for ready adjustment of the lens a transverse direction to properly position the principal point with respect to the center of collimation, or if this can be done by ready movement of the collimation index markers, this task is done in the course of the test. Following adjustment, the camera is checked and, if satisfactory, pins are set to insure preservation of the space relations between collimation index markers and principal point of auto-collimation.

When a camera is submitted for test, it is mandatory that the drill holes for the pins be already present in one of the members that move with respect to one another. In addition, a proper sized drill and reamer and a sufficient number of pins to perform the doweling must accompany the camera. It is desired that roll pins be submitted for this task.

Item	Description	Fee
202.202a	Determination of focal length and back focal distance	$38.00
202.202b	Determination of equivalent focal length back focal distance, separation of nodal points, and thickness	54.00
202.202c	Determination of equivalent focal length, back focal distance, separation of nodal points, and distortion at 5° intervals from the center to edge of field for one specified ratio of object to image size	165.00
202.202d	Fee for each additional ratio	81.00
202.202e	Determination of resolving power at 5° intervals from center to edge of field for parallel light at one aperture	43.00
202.202f	Determination of back focal distance, equivalent focal length, distortion and resolving power at 5° intervals from the center to edge of the field. This is the test usually required for lenses that are to be mounted in precision airplane cameras.	98.00
202.202g	Determination of equivalent focal length and true geometric f-number for one marked stop	54.00
202.202h	Fee for each additional stop	17.00
202.202i	Determination of focal length for lens mounted in camera	60.00
202.202j	Fee for each extra magazine	38.00
202.202k	Determination of compliance of camera platen with flatness requirements to ±0.0005 in	17.00
202.202l	Determination of equivalent focal length, distortion, and resolving power at 7.5° intervals from center to edge of field for lens mounted in camera	130.00
202.202m	Location of the principal point of auto-collimation and check of 90° condition for lens mounted in camera	135.00
202.202n	Setting the principal point of auto-collimation and 90° condition, checking and doweling for lens mounted in camera	110.00
202.202z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.203 Optical components, spectacle lenses, goggle lenses, etc.

Item	Description	Fee
	Optical components	
202.203a	Determination of equivalent focal length of single-component lens	$38.00
202.203b	Determination of a single radius of curvature (single surface or matched pair). Fee determined by the nature of the work required; minimum fee	81.00
202.203c	Determination of spherical and cylindrical power, axis of sphere, and axis of cylinder for a single spectacle lens	22.00
202.203d	Fee for each additional lens	17.00
202.203e	Determination of spehrical and cylindrical powers, axis of sphere, and axis of cylinder for a single spectacle lens with bifocal segment	33.00
202.203f	Fee for each additional lens	22.00

Item	Description	Fee
	Sunglass lenses	
202.203g	Determination of refractive power, surface quality, and definition to determine compliance of a single sunglass lens with commercial standards	$22.00
202.203h	Fee for each additional lens	17.00
	Goggle lenses	
202.203i	Determination of lens dimensions, refractive power, prismatic power, and definition; and making drop test on a single hardened goggle lens to determine compliance with Federal Specification GGG-G-501b	22.00
202.203j	Fee for each additional lens	17.00
202.203z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.204 Refractometric instruments.

Every instrument submitted for test should be in good working order. The test slab or standard supplied by the maker, and the tables if any, must accompany each refractometer. Upon request special attention will be given to such portions of the scale as may be of particular importance in the contemplated use of the instrument. Refractometers with compensators will be tested with "white" light unless otherwise specified. Refractometers without compensators will be tested only with sodium light unless otherwise specified.

Item	Description	Fee
202.204z	For special tests and calibrations of refractometric measurements, fees will be charged dependent upon the nature of the test.	

§ 202.205 Refractive indices.

When submitting media for index measurement, the temperature, wavelength of light (or spectral line), and approximate degree of desired precision should be specified. Liquid samples should usually be as large as 10 ml. Solids for item d must be in the form of test slabs, approximately $1 \times \frac{1}{2} \times \frac{3}{16}$ in., such as are commonly used for the adjustment of Abbe refractometers. Two surfaces must be pitch polished (plane within approximately one wavelength) and intersect at 90° to form an unbeveled edge.

Item	Description	Fee
	Index of refraction ($\pm 1 \times 10^{-4}$) for D spectrum line for one liquid by precision Abbe refractometer:	
202.205a	Determination of index for single temperature	$43.00
202.205b	Determination of index for each additional sample submitted at the same time for same temperature, or for each determination and additional spectral lines for same temperature	22.00
202.205c	One index determination at each additional temperature	27.00
	Index of refraction ($\pm 1 \times 10^{-4}$) for D spectrum line for one solid by precision Abbe refractometer:	
202.205d	Determination of index for one sample	27.00
202.205e	Determination of index for each additional spectrum line, C, F, or G	11.00
202.205f	Determination of index of refraction ($\pm 1 \times 10^{-4}$) of solid submitted in form of 60° prism for one visible spectrum line: Determination of index	$38.00
202.205g	For each additional line in the visible spectrum	18.00
202.205z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.206 Polarimetric instruments.

Item	Description	Fee
202.206a	Calibration of quartz saccharimeter-control plates: Single plate	$110.00
	Double plates	165.00

Photographic Research

§ 202.311 Photography.

The following information is pertinent to the tests a to f in this schedule.

a. American Standard Printing Transmission Density, Type P2–b, is measured on step tablets of 21 steps or less. This type of density is the one most commonly employed in the photographic industry and is customarily implied when the type of density is not specified. Densities greater than 4.10 are not calibrated as part of this test, but must be ordered separately under item 202.311z. The densities of tablets of high quality are measured with a precision such that three times the standard deviation of the mean is 0.01 or 1 percent whichever is greater. Defective tablets cannot be measured with this precision. Tablets submitted for calibration must be free of scratches, fingerprints, abrasions, and foreign matter and must have steps of uniform density. Tablets not suitable as standards are not accepted for calibration.

b. American Standard Diffuse Visual Transmission Density, Type VI–b. The comments on precision and quality of standards given in item a above apply here also.

c, d. The determination of the residual sodium thiosulfate content of processed photographic film is made according to American Standard Method PH4.8–1958 or the latest revision thereof.

Hypo concentrations less than 0.005 mg per square inch are reported as "nil". When hypo concentration is 0.005 mg per square inch or over, it is reported to one significant figure.

Each sample submitted should be properly identified, contain no image (slight fog permissible), and must be submitted immediately after processing.

Each sample submitted should be 6 to 8 in. in length and should be attached securely to request letter by stapling.

Samples are not returned since they are destroyed during tests.

e, f. The determination of residual sodium thiosulfate concentration of processed photographic paper is made according to American Standard Method PH4.30–1962 or the latest revision thereof.

Each sample submitted should be properly identified, contain no image (slight fog permissible), and be of such dimensions that two strips, 1 x 4 in., can be cut for test.

Item	Description	Fee
202.311a	Calibration of photographic step tablets for printing density, one sample	$33.00
202.311b	Calibration of photographic step tablets for visual density, one sample	33.00
202.311c	Residual sodium thiosulfate concentration of processed film, one sample	14.00
202.311d	Each additional sample for the determination of residual sodium thiosulfate in film submitted at the same time	$4.00
202.311e	Residual sodium thiosulfate concentration of processed photographic paper, one sample	24.00
202.311f	Each additional sample for the determination of residual thiosulfate concentration of processed photographic paper submitted at the same time	6.00
202.311z	For special tests not covered by the above schedule, such as precise determination of contract printing density and measurements of resolving power of photographic materials, fees will be charged dependent upon the nature of the test.	

Length

§ 202.401 Reference line standards of length.

Item	Description	Fee
202.401z	Calibrations of reference line standards to a higher degree of accuracy than that provided in schedule 202.402 are regarded as special tests. Fees will be charged dependent upon the nature of the test; they may be approximately estimated as twice the corresponding fees of schedule 202.402.	

§ 202.402 Working line standards of length.

Item	Description	Fee
202.402a	Working line standard 40 inches or less in length—determination of the total length, or other interval, at 68° Fahrenheit (20° Celsius) to an accuracy of 0.00004 inch or 0.001 mm if the character of the graduation justifies	$165.00
202.402b	Working line standard—determination of any other single interval	81.00
202.402c	Working line standard—determination of equal submultiples of the length determined under item a or b, each	33.00
202.402z	For special tests not covered by the above schedule, including determination of linear thermal expansion, fees will be charged dependent upon the nature of the test.	

§ 202.403 Commercial line standards of length.

Item	Description	Fee
202.403z	Calibrations of commercial line standards of length to an accuracy of 0.01 mm or 0.0004 in., if the character of the graduation justifies, are regarded as special tests. Fees will be charged dependent upon the nature of the test; they may be approximately estimated as one-half of the corresponding fees of schedule 202.402.	

§ 202.404 Steel tapes.

(a) Steel tapes accepted by the Bureau as suitable for calibration will be issued a National Bureau of Standards Report of Calibration. Steel tapes are used for many types of long-interval measurements. The varied requirements for the application of calibrated steel tapes to length measurements necessarily require variance in type and location of interval markings and accessory attachments. Some tapes, although being of excellent quality and having application that jus-

tifies NBC calibration, are not necessarily suitable for use as reference tapes (see paragraph b). Such steel tapes for which a Report of Calibration has been issued will be engraved with an NBS serial number for identification purposes. A steel tape considered by the Bureau to be suitable for use as a reference tape for checking other calibrated or uncalibrated steel tapes, or for other appropriate uses, will also be engraved with a mark indicating the year of calibration. Reports of Calibration normally will indicate the measured lengths of intervals to the nearest 0.001 foot or 0.1 mm. Length values will be reported at 68° F (20° C).

(b) A steel tape considered suitable for use as a reference tape, as defined above, should possess the following minimum requirements: The error in total length of the tape at the standard temperature of 68° F (20° C) and at standard tension shall not exceed 0.1 in. per 100 ft. (2 mm per 25 m). The standard tension is 10 lb. (4.5 kg) for tapes 25 to 100 ft., or from 10 to 30 m in length and 20 lb. (9 kg) for tapes longer than 100 ft. or 30 m. From the standpoint of inherent stability and to prevent the possibility of accidental displacement of reference graduations, a reference tape should normally possess the following characteristic: All interval graduations should be on a single piece of metal ribbon. This is usually construed to imply that the graduations should not be on pieces of solder, sleeves, thin plates or blocks bonded or attached to the tape, or on wire loops, spring balances, tension handles, or other accessories likely to be detached or changed in shape.

Item	Description	Fee
202.404a	Steel tape—determination of correction to the total length of the tape when supported throughout at standard tension and at standard temperature, for a tape not exceeding 200 ft or 50 m in length.... This is the regular standard test which will be made and charged for in each case. To this amount must be added the fees for any additional tests made, and for item (n), if applicable, in accordance with the following schedule.	$30.00
202.404b	Steel tape—determination of the correction to the total length when supported throughout any tension other than standard tension, for a tape not exceeding 200 ft or 50 m in length.... Tension desired must be specified.	6.00
202.404c	Steel tape—determination of the correction to total length when supported at the ends only.... The Bureau is not prepared to make this test on tapes having a greater length than 200 ft or 50 m. Standard tension will be used unless another tension is specified.	6.00
202.404d	Steel tape—determination of the correction to the total length when supported at the ends and at one or more intermediate points, for a tape not exceeding 200 ft or 50 m in length.... Standard tension will be used unless another tension is specified.	6.00
202.404e	Steel tape—determination of the correction to the length of a subinterval under the same conditions as to tension and points of support as for the total length.... The points at which these measurements are made must be points at which the tape is supported. The Bureau is not prepared to test tapes supported at points more than 200 ft or 50 m apart.	5.00
202.404f	Steel tape—determination of the correction to the length of a subinterval under different specified conditions as to tension and points of support from those used for the total length.... See item (e) above.	$6.00
202.404g	Steel tape—determination of the tension to the nearest integral half-pound or quarter kilogram at which the correction to the length of an interval is most nearly zero, under a specified condition of support, for a tape not exceeding 200 ft or 50 m....	6.00
202.404h	Steel tape—determination of the correction to a subinterval at the tension at which the correction to the total length is most nearly zero and under the conditions of support used in the test under item (g)....	5.00
202.404i	Steel tape—determination of correction to the total length of an interval on the reverse side of the tape, when supported at standard tension and at standard temperature, for a tape not exceeding 200 ft or 50 m in length....	6.00
202.404j	Steel tape—determination of the coefficient of expansion of a tape, fee will be determined in each individual case.	
202.404l	Steel tape—determination of the weight per foot or per meter of a tape....	9.00
202.404m	Spring balance—testing in horizontal position....	17.00
202.404n	Steel tape—additional charge for each tape sent without reel....	6.00
202.404o	Steel tape—determination of AE....	17.00
202.404p	Steel tape—computed values (this does not include charge for necessary measurements)....	6.00
202.404z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.405 Invar base-line tapes.

For testing of steel tapes, see schedule 202.404. The test of an invar base-line tape of any length less than 50 m on the NBS geodetic-tape comparator will, in general, be made for the same fee as a 50-m invar base-line tape. Attention is called to the fact that only invar base-on this comparator. Invar tapes not tested on the geodetic-tape comparator will be tested on the bench standard under items 202.405 (l) and (m).

Item	Description	Fee
202.405a	Invar 50-m base-line tape—determination on the geodetic comparator of total length with a probable error not greater than ±0.050mm....	$165.00
202.405b	Invar 50-m base-line tape—determination on the geodetic comparator of total length at an additional tension and/or method of support, with a probable error not greater than 0.050mm....	43.00
202.405c	Invar 50-m base-line tape—determination of total length supported throughout, by computation from the observed length when supported at the ends and one or more intermediate points....	22.00
202.405d	Invar 50-m base-line tape—high-precision calibration of a group of uniformly spaced subintervals when supported on a horizontal flat surface, using the same tension specified for test item 202.405c. Charge for each interval....	22.00
202.405e	Invar 50-m base-line tape—determination on the geodetic comparator of the coefficient of expansion with an accuracy of at least 0.000001 per degree Celsius using the electrical resistance method and calibration of its total length at one temperature, tension, and method of support with a probable error not greater than ±0.050mm....	245.00
202.405g	Invar base-line tape—determination of the weight per meter (or per foot)....	$9.00
202.405h	Spring balance—testing in horizontal position....	17.00
202.405i	Invar base-line tape—additional charge for each tape sent without a reel....	6.00
202.405j	Invar base-line tape—determination of AE....	17.00
202.405k	Invar base-line tape—computed values other than as provided in item 202.405c....	6.00
202.405l	Invar base-line tape not more than 50-m in nominal length—determination on bench standard at room temperature of length of one interval when supported at one method of support and under one tension, or determination of the tension to the nearest integral half pound or quarter kilogram at which the correction to the length of the interval is most nearly zero at a specified method of support....	49.00
202.405m	Invar base-line tape not more than 50-m in nominal length—each additional determination on bench standard at room temperature of length of interval, or tension to the nearest integral half pound or quarter kilogram at which the correction to the length of an interval is most nearly zero....	18.00
202.405z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.406 Surveyors' measuring instruments (other than tapes).

Item	Description	Fee
202.406a	Leveling rod—testing principal intervals....	$52.00
202.406z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.407 Sieves.

NOTE: The precision seal of the National Bureau of Standards on any sieve indicates that the sieve has been tested at the Bureau and found to conform to specification. Except by special arrangements, the testing of sieves at the Bureau is limited to No. 2½ to No. 400 inclusive.

Item	Description	Fee
202.407a	Sieve—test of a sieve No. 2½ to No. 400 inclusive to determine conformity to specification, but not including the sieving test....	$18.00
202.407z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.408 Haemacytometers.

Each haemacytometer chamber and each cover glass which passes the specification is marked with a National Bureau of Standards precision seal. In general, work will be discontinued when a substantial number of items in a lot fail to comply with the specifications, and the fee will be computed on the basis of the number of items tested plus a special handling charge. Items 202.408 a to e inclusive will be applicable if a minimum of 12 chambers are submitted at one time; otherwise item 202.408z will be applicable. Only one letter reporting results of test will be supplied for any one test at the prices of items 202.408 a to e inclusive.

Item	Description	Fee
202.408a	Single Neubauer haemacytometer chamber—testing single cell chamber (having Neubauer ruling) and two cover glasses for conformity with specification	$8.00
202.408b	Single Fuchs-Rosenthal haemacytometer chamber—testing single cell chamber (having Fuchs-Rosenthal ruling) and two cover glasses for conformity with specification	11.00
202.408c	Double Neubauer haemacytometer chamber—testing double cell chamber (having two Neubauer rulings) and two cover glasses for conformity with specification	9.00
202.408d	Double Fuchs-Rosenthal haemacytometer chamber—testing double cell chamber (having two Fuchs-Rosenthal rulings) and two cover glasses for conformity with specification	22.00
202.408e	Quadruple haemacytometer chamber—testing quadruple cell chamber (having two Neubauer rulings and two Fuchs-Rosenthal rulings) and two cover glasses for conformity with specification	23.00
202.408z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.410 Precision circles.

Item	Description	Fee
202.410z	Special tests only are conducted in this category and fees will be charged dependent upon the nature of the test.	

§ 202.411 Linear thermal expansion of solids.

Item	Description	Fee
202.411z	Special tests only are conducted in this category and fees for accepted tests will be charged dependent upon their nature. Only those tests that cannot be carried out elsewhere may be accepted.	

§ 202.412 Gage blocks.

(a) Test fee schedules in § 202.412 include a statement of the accuracy to which measurements are ordinarily made; however, if the character of the defining surfaces of a gage block is not such as to warrant this accuracy, the report will show the accuracy actually obtained. All gage blocks submitted for test should be in substantially new block condition and each block should be marked with an identification number.

(b) In the shipment of gage blocks extreme care should be taken both against corrosion and damaged by contact with other gage blocks during transit. All defining steel surfaces should be greased and the blocks padded with waxed paper or volatile rust inhibitor treated paper. A greased steel surface coming in contact with newspaper, wrapping paper (unwaxed) or excelsior is very likely to corrode. Sets of gage blocks should have packing inside the case, and the case should be bound shut as the clasps frequently open or break during shipment.

(c) Shipments and purchase orders should be sent to the National Bureau of Standards, Washington, D.C., 20234, marked to the attention of the Length Section.

Item	Description	Fee
202.412a	Gage blocks—determination of length to ±0.000004 in. and excessive errors in flatness and parallelism, for sizes from 0.100 in. to and including 1.000 in., in lots of 10 or more, each	$8.00
	Actual cost of calibration will be charged for smaller lots.	
202.412b	Gage blocks—determination of length to ±0.000005, ±0.000006, and ±0.000007 in., respectively, for blocks from 1 to 2 in., 2 to 3 in., and 3 to 4 in. in length, and excessive errors in flatness and parallelism, in lots of three or more, each	23.00
	Actual cost of callibration will be charged for smaller lots.	
202.412ab	Measurements as described under items (a) and (b) for usual 81-block set, per set	570.00
	Extra blocks will be charged for under items (a) or (e).	
202.412c	Gage blocks—determination of length to ±0.000002 in. and excessive errors in flatness and parallelism, for sizes from 0.100 in. to and including 1.000 in., in lots of 10 or more, each	12.00
	Actual cost of calibration will be charged for smaller lots.	
202.412d	Gage blocks—determination of length to ±0.000002, ±0.000003, and ±0.000004 in., respectively, for blocks from 1 to 2 in., 2 to 3 in., and 3 to 4 in. in length, and excessive errors in flatness and parallelism, in lots of three or more, each	35.00
	Actual cost of calibration will be charged for smaller lots.	
202.412cd	Measurements as described under items (c) and (d) for usual 81-block set, per set	960.00
	Extra blocks will be charged for under items (c) or (e).	
202.412e	Gage blocks—determination of length to ±0.000003 in. and excessive errors in flatness and parallelism, for sizes from 0.010 in. to and including 0.090 in. in lots of 10 or more, each	9.00
	Blocks in this size range are usually warped and do not warrant calibration to a higher accuracy. In special cases blocks 0.040 in. and thicker will be calibrated under item (c) if the errors in flatness of the blocks are not excessive.	
202.412f	Gage blocks—determination of length to ±0.000001 in. per inch of length and excessive errors in flatness and parallelism, for blocks of the following length: 5, 6, 7, 8, 10, 12, 16, and 20 in., in lots of three or more, each	54.00
	Actual cost of calibration will be charged for smaller lots.	
202.412z	For special tests not covered by the above schedules, fees will be charged dependent upon the nature of the test.	

Engineering Metrology

§ 202.500 General.

(a) Test fee schedules 202.501 to 202.509 include a statement of the relative accuracy to which measurements are ordinarily made. However, if the character of the defining surface of a gage or other article is not such to warrant the measurement to this accuracy, the report will show the accuracy actually obtained. If a greater accuracy is requested and the defining surfaces are such as to permit measurements to the accuracy requested, the necessary measurements will be made and a special fee will be charged.

(b) In addition to the items covered by schedules 202.501 to 202.509 other items such as gage block accessories, taper plug and ring gages, and gill net gages are occasionally calibrated. Sizes other than those listed in the fee schedules are also calibrated on special request. These tests and calibrations are made so infrequently that it is not practical to list a definite fee, and such work will be done on the basis of the cost of the work.

(c) In the shipment of gages, extreme precautions should be taken both against corrosion and damage by contact with other gages during transit. All defining steel surfaces should be greased and protected with waxed paper or a suitable strippable plastic coating. A greased steel surface coming in contact with newspaper, wrapping paper (unwaxed), or excelsior is very likely to corrode. Small gages suitably wrapped may be fastened in place in a strong container so that no movement is possible. Plug and ring gages should ordinarily not be shipped mated. In the case of large-size threaded plugs and rings, however, mating is permissible as a means of protecting the plug threads. In such cases a grease must be used that will prevent electrolytic corrosion between the mating gages.

(d) Minimum test fee for calibration work is $20.00.

§ 202.501 End standards of length.

Item	Description	Fee
	End standards with spherical or pointed ends, or flat ends with area of contact less than ⅛ in.²:	
202.501a	Determination of length to ±0.00005 in. for lengths up to and including 8 in., each	$14.00
202.501b	Determination of length to ±0.000005 in. per inch of length for lengths over 8 in. up to and including 20 in., each	20.00
202.501c	Determination of length to ±0.000005 in. per inch of length for lengths over 20 in. up to and including 40 in., each	24.00
202.501d	Determination of length to ±0.000005 in. per inch of length for lengths over 40 in. up to and including 72 in., each	28.00
202.501e	Determination of length to ±0.00002 in. for lengths up to and including 8 in., each	28.00
202.501f	Determination of length to ±0.000003 in. per inch of length for lengths over 8 in. up to and including 20 in., each	38.00
202.501g	Determination of length to ±0.000003 in. per inch of length for lengths over 20 in. up to and including 40 in., each	48.00
202.501h	Determination of length to ±0.000003 in. per inch of length for lengths over 40 in. up to and including 72 in., each	56.00
202.501z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.502 Plain cylindrical plug and ring gages.

Item	Description	Fee
202.502a	Plain cylindrical plug gages—determination of diameter, taper, and roundness to ±0.00005 in. for sizes up to and including 4 in., each	$14.00
202.502b	Plain cylindrical plug gages—determination of diameter, taper, and roundness to ±0.00001 in. for sizes up to and including 2 in., each	41.00
202.502c	Plain cylindrical plug gages—determination of diameter, taper, and roundness to ±0.000005 in. for sizes up to and including 2 in., each	59.00
202.502d	Plain cylindrical ring gages—determination of diameter, taper, and roundness to ±0.00001 in. for sizes 0.03 in. up to and including 2 in., each	59.00

Item	Description	Fee
202.502e	Plain cylindrical ring gages—determination of diameter, taper, and roundness to ±0.000005 in. for sizes 0.03 in. up to and including 2 in., each	$89.00
202.502f	Plain cylindrical ring gages—determination of diameter, taper, and roundness to ±0.000003 in. for sizes 0.25 in. up to and including 2 in., each	115.00
202.502z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.503 Thread plug and ring gages.

Item	Description	Fee
202.503a	Straight thread plug gages and setting thread plug gages—determination of angle to 3′ to 15′ depending on pitch and diameter; lead error and pitch diameter to 0.0001 in., major diameter to 0.0002 in. thread form as to clearance, for sizes ¼ in. to 6 in., each.	$36.00
202.503b	Straight thread ring gages—determination of angle to 3′ to 15′ depending on pitch and diameter, lead error to 0.0001 in., minor diameter to 0.0002 in., thread form as to clearance, and fit on setting plug, for sizes ¼ in. to 6 in., each	36.00
202.503c	Taper thread plug gages having 60° threads (except API Cable and Rotary gages)—determination of half angles to 3′ to 15′ depending on pitch and diameter, lead error, pitch diameter and taper to 0.0001 in., major diameter to 0.0003 in., and thread form as to clearance, for sizes up to and including 10 in., each	89.00
202.503d	Taper thread plug gages having 60° threads—determination of half angles to 3′ to 15′ depending on pitch and diameter, lead error and taper to 0.0001 in., pitch diameter to 0.0002 in., major diameter to 0.0004 in., and thread form as to clearance, for sizes over 10 in. to 24 in., inclusive, each	115.00
202.530e	Taper thread ring gages having 60° threads (except API Cable and Rotary gages)—determination of angle to 3′ to 15′ depending on pitch and diameter, lead error to 0.0001 in., taper to 0.0002 in., minor diameter to 0.0005 in. (or truncation of thread crest), thread form as to clearance, and standoff from mating plug to 0.002 in. for sizes up to 10 in., each	71.00
202.503f	Taperthread ring gages having 60° threads—determination of angle to 3′ to 15′ depending on pitch and diameter, lead error to 0.0001 in., taper to 0.0002 in., minor diameter to 0.0005 in. (or truncation of thread crest), thread form as to clearance, and standoff from mating plug to 0.0002 in., for sizes over 10 in. to 24 in., inclusive, each	115.00
202.503g	API Cable and Rotary taper thread plug gages—determination of dimensions specified in API Standard 7, each	130.00
202.503h	API Cable and Rotary taper thread ring gages—determination of dimensions specified in API Standard 7, each	89.00
202.503i	API Cable and Rotary tool connection gages— determination of mating standoff and standoff from grand master gages, per set	27.00
202.503j	API sucker rod plug gages designated as P1, P5, P7, B2, and B6—determination of dimensions specified in API Standard 11B, each	36.00
202.503k	API sucker rod plug gages designated as P3 and B4—determination of dimensions specified in API Standard 11B, each	71.00
202.503l	API sucker rod ring gages designated as P2, P6, P8, B1, and B5—determination of dimensions specified in API Standard 11B, each	36.00
202.503m	API sucker rod ring gages designated as P4 and B3—determination of dimensions specified in API Standard 11B, each	89.00
202.503n	API sucker rod gages—determination of dimensions specified in API Standard 11B for the inspection of used gages, per set of any size	$165.00
202.503o	API buttress casing plug gages—determination of dimensions specified in API Standard 5B, for sizes up to 10 in., each	100.00
202.503p	API buttress casing plug gages—determination of dimensions specified in API Standard 5B, for sizes over 10 in., each	125.00
202.503q	API buttress casing ring gages—determination of dimensions specified in API Standard 5B, for sizes up to 10 in., each	82.00
202.503r	API buttress casing ring gages—determination of dimensions specified in API Standard 5B, for sizes over 10 in., each	115.00
202.503s	API extreme line casing plug gages—determination of dimensions specified in API Standard 5B, each	175.00
202.503t	API extreme line casing ring gages including seal element—determination of dimensions specified in API Standard 5B, each	175.00
202.503u	API extreme line casing gages—determination of mating standoff, standoff with grand master gages, R and S dimensions as specified in API Standard 5B, per set	120.00
202.503z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.504 Instruments and components.

Item	Description	Fee
202.504a	Micrometer calipers—determination of errors at 10 points selected to test uniformity o graduations as well as lead errors. Also determination of planeness and parallelism errors of contact surfaces, each	$54.00
202.504b	Dial micrometers—determination of errors in each one-tenth revolution of the pointer for one revolution and each half revolution up to five revolutions, each	38.00
	In the case of dial micrometers, the accuracy obtainable depends on the value of the smallest division on the dial and on the mechanical condition of the instrument as evidenced by the degree to which it will repeat its indications.	
202.504c	Thread wires—determination of diameter, straightness, and roundness of each of three wires in a set in accordance with specification for wires in NBS Handbook H28, Screw Thread Standards for Federal Services, and determination of mean diameter and C correction, for the best sizes of wires for standard 60° screw threads, from 2 to 80 threads per inch and for 29° Acme screw threads from 1 to 20 threads per inch, per set of three wires	6.00
202.504d	Gear wires—determination of diameter, straightness, and roundness of each of two wires in a set to an accuracy of ±0.000010 in., per set	8.00
202.504e	Master wires—determination of mean diameter, and straightness to an accuracy of ±0.000005 in., each	18.00
202.504f	Penetration needles—test for compliance with ASTM Specification D5-61, without reporting actual dimensions, for 1 to 10 needles	59.00
202.504g	Same, each additional needle	5.00
202.504h	Petroleum wax penetration needles—test for compliance with ASTM Specification D1321-61T, without reporting dimensions, each	6.00
202.504i	Penetration needle numbering—all needles must have individual identification numbers, needles received without identification will be marked, each	4.00
202.504j	Polariscope tubes—determination of the average length of polariscope observation tube and marking with NBS serial number if length is within ±0.03 mm of nominal length for 100 to 200 mm tubes and ±0.04 mm for 400 mm tubes, each	27.00
202.504z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.505 Optical reference planes.

Item	Description	Fee
	Optical reference planes are tested interferometrically, horizontally supported with test surface supported on three equally spaced pads located at 0.7 of the radius from the center. The test is performed along two marked diameters at 90° to each other on each surface, when each diameter is parallel to two of the support pads. Graphs of the profiles are supplied.	
202.505a	Optical reference plane—to an accuracy of ±0.0000005 in. for sizes not exceeding 6 in., per surface	$82.00
202.505b	Optical reference plane—to an accuracy of ±0.0000005 in. for sizes larger than 6 in. but not exceeding 8 in. in diameter, per surface	120.00
202.505c	Optical reference plane—to an accuracy of ±0.0000005 in. for sizes larger than 8 in. but not exceeding 10 in. in diameter, per surface	175.00
202.505z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.506 Angle blocks.

Item	Description	Fee
202.506a	Calibration of set of AA grade angle blocks consisting of one each of the following sizes: 1, 3, 5, 20, and 30″; 1, 3, 5, 20, and 30′; 1, 3, 5, 15, 30, and 45°—determination of flatness of faces, parallelism of elements of surfaces and angle between faces. Accuracy of angle between faces 0.5″. Per set	$410.00
202.506z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.507 Polygons.

Item	Description	Fee
	Calibration of polygons—determination of flatness of faces, variation of the angles between faces and the base of the polygon (where possible the polygon will be adjusted for minimum variation) and the angle between faces. Accuracy of values for angles between faces 0.5″ or less:	
202.507a	Polygons having 4, 5, or 6 sides, each	$205.00
202.507b	Polygons having 8, 9, or 10 sides, each	235.00
202.507c	Polygons having 12 sides, each	295.00
202.507d	Polygons having 15 sides, each	355.00
202.507e	Polygons having 24 sides, each	470.00
202.507f	Polygons having 36 sides, each	940.00
202.507g	Polygons having 72 sides, each	2,350.00
202.507z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

§ 202.508 Master balls.

Item	Description	Fee
202.508a	Steel or Carbide balls—determination of diameter to ±0.000050 in. for sizes from 1/16 in. to 1 in., each	$12.00
202.508b	Steel or Carbide balls—determination of diameter to ±0.000010 in. for sizes from 1/16 in. to 1 in., each	18.00

Item	Description	Fee
202.508c	Master balls—determination of diameter to ±0.000005 in. by comparison with NBS master and measurement of roundness of two equators, for sizes from ⅛ in. to ½ in. by 1/32 in. steps and ½ in. to 1 in. by 1/16 in. steps. Tests applied only on balls with diameter variation of 0.000005 in. or less and deviation from nominal size within ±0.000030 in., each	$29.00
202.508d	Master balls—determination of mean diameter from three interferometric readings to an accuracy of ±0.000003 in. and measurement of roundness of three equators. For sizes up to 1 in. in diameter. Test made only on balls with diameter variation of 0.000003 in. or less, each	71.00
202.508z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test	

§ 202.509 Gears.

Item	Description	Fee
202.509a	Tooth index measurement—calibration results recorded in tape form with each tooth location being represented by a plateau and another tape taken simultaneously of the reference diameter location during the tooth index calibration. Gears, master gears, gear cutters, and index plates, from 0.125 in. diameter to about 8.0 in. diameter and from about 24 teeth to 500 teeth. The maximum overall length of the part must be less than 3 in. Suitable reference and calibration surfaces must be available to obtain the estimated accuracy of ±3″ of arc.	
	For 71 teeth or less, each	$190.00
	For 72 teeth or more, each	235.00
	The cost of any needed adaptors will be added to the calibration cost, if made by the Bureau.	
202.509z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

Mass and Volume

§ 202.620 General.

(a) *Calibration and testing.* (1) Calibration consists of determining the value, either mass or volume, relative to an accepted standard. It is assumed that all items submitted for calibration will be used as reference standards. (This designation implies the use of a correction or actual value of the standard in all measurements relative to it.) Results of a calibration will be reported in a National Bureau of Standards Report of Calibration listing the value together with an appropriate uncertainty. The Report of Calibration makes no reference to the compliance with existing class tolerances which limit the departure of actual value from the nominal value.

(2) Testing consists of establishing compliance with applicable specifications or tolerances. If the need is critical and the service is not available elsewhere, items may be accepted for test. The results of the test will be reported in a National Bureau of Standards Report of Test, which generally is a statement indicating the compliance, or noncompliance, with the particular specification or tolerance.

(3) Acceptance for calibration or test is based on inspection at the Bureau. Acceptance is based on suitability for use as a reference standard. Items not accepted for calibration or test will be returned, the appropriate cleaning, handling, and inspection fee being applicable.

(4) The established fees are based on satisfactory test or calibration effected by normal procedures. Total cost of test or calibration will include cost of items required to facilitate the use of normal procedures. Examples of items, the cost of which will be added to the established fees as routine procedures, are replacement of missing small weights, repairs to damaged surfaces, the cleaning and greasing of glass stopcocks, repairs to shipping cases or crates, and the reconditioning or modification closures for weight-adjustment cavities.

(5) Occasionally items are received for test which vary excessively from nominal. Such variation becomes evident in the actual calibration or test. Completion of calibration or test may require considerable deviation from normal procedures. For such cases, the fee will be computed on a cost basis.

(6) When requested, receipt of items and purchase orders will be acknowledged. Such acknowledgment will not contain a price quotation. Actual cost of the calibration or test will be stated in the acknowledgment copy of NBS Form 64. Usually, this acknowledgment is issued sufficiently in advance of the completion of the work so that change orders can be processed prior to return shipment.

(b) *Correspondence and purchase orders.* (1) All correspondence concerning calibration and testing should be addressed to the National Bureau of Standards, Attention: Mass and Volume Section, 212.31, Washington, D.C., 20234.

(2) The purchase order or calibration request must include complete information concerning the following items:

(i) Purchase order number or authority to charge against existing open purchase order.

(ii) Legal owner of item.

(iii) Nominal designation and total number of items by count.

(iv) Shipping instructions for shipment to other than name stated in (i).

(v) Previous Bureau of Standards test number if appropriate.

(3) After completion of calibration or test, items will be packed and shipped as directed. The Report of Calibration or the Report of Test, whichever is applicable, will be mailed under separate cover.

§ 202.621 Reference standards of mass.

(a) Reference standards of mass are weights or weight sets of design, material, and surface finish comparable to, but not necessarily limited to present Class A, B, M, S, or S–1 as described in Circulars 3 and 547 in Volume III of NBS Handbook 77. Standards accepted are calibrated with reference to NBS standards of mass, with an uncertainty compatible with the equipment and methods used.

(b) Packing and shipping:

(1) Weights must be carefully packed. If shipped in their regular cases the weights should be tightly packed in their pockets by the use of extra materials of some sort.

(2) In many instances the sheet-metal weights that are packed under the glass covers of the regular cases reach the Bureau bent or otherwise damaged. Care should be given the packing of these weights. Sufficient extra packing should be used to hold the glass cover firmly in place.

(3) Many of the laboratory and storage weight cases now in service are not designed to retain the weights in the pockets during shipment. Also, shipments of weights are sometimes subjected to exceptionally rough handling. It is strongly recommended that weights larger than 200 g be removed from the laboratory or storage cases and packed for shipment as described in this section. Do not ship empty storage cases.

(4) Some soft but firm materials should be used next to weight and bound tightly against it to avoid possibility of abrasion. If tissue paper is used, many thicknesses should be firmly wrapped on. This then should be covered with thicker, tougher material such as cotton gauze or knit goods. The whole should then be wrapped securely in heavy wrapping paper to exclude the dust and grit from rough packing material. Each package should be clearly labeled.

(5) Weight identification, purchase order number and legal owner must be clearly designated on the packing slip. Enclose packing slip in envelope and attach to outside of box (wrap with weights if package is small). Envelope should be clearly marked. Also package with the weights an information sheet stating the density and composition or accepted trade name of the material of which the weights are made, also the construction and surface protection of the weights.

(c) Calibration:

(1) Cleaning, inspection, and handling in accordance with fee schedule 202.621 (a through d) will apply to all weights accepted for calibration.

(2) The true mass and/or apparent mass corrections are determined using computed volumes based on the manufacturers statement of density of the material. (In the absence of this information, estimated densities are used.) The apparent mass correction at 20° C is computed with reference to Normal Brass (density 8.4 g/cm at 0° C: Volume coefficient expansion 0.000054/C°, air density 1.2 mg/cm³). Apparent mass corrections computed to any other basis will be furnished if requested. Fee in accordance with 202.621 (e through z) will apply for calibration.

(3) Measurement of volumes for use in computing corrections will be done on a cost basis (202.621z). Correspondence or consultation as to the exact requirements must provide a basis for such calibration.

Item	Description	Fee
	Inspection, cleaning, and handling (also applies to weights not accepted for calibration).	
202.621a	For single weight not greater than 50 lb or 20 kg	$24.00
202.621b	For each set or group of weights submitted as a unit, when the largest weight is not greater than 2 lb or 1 kg	30.00
202.621c	For each set or group of weights submitted as a unit, when the largest weight is not greater than 20 lb or 10 kg but is greater than 2 lb or 1 kg	41.00
202.621d	For each set or group of weights submitted as a unit, when the largest weight is not greater than 50 lb but is greater than 20 lb or 10 kg	54.00
	Calibration, in addition to appropriate inspection, cleaning, and handling fees.	
202.621e	For sets 100 g to 1 mg, or sets within this range	325.00
202.621f	For sets 100 g to 50 mg, or sets within this range	290.00
202.621g	For sets 100 g to 1 g, or sets within this range	145.00
202.621h	For sets 1 g to 1 mg, or sets within this range	190.00
202.621i	For individual weights, 100 g or less.	24.00
202.621j	For each individual weight greater than 100g but not greater than 2kg.	36.00
202.621k	For each individual weight greater than 2 kg but not greater than 20 kg	48.00
202.621z	Other operations will be charged for on the basis of actual cost of time and materials.	

§ 202.622 Large mass standards.

(a) Large mass reference standards are weights over 50 lbs. (up to and including 10,000 lbs.). Acceptance for calibration is based on suitability with regard to general design and upon assurance of usage as a reference standard. Calibration includes adjustment to nominal value.

(b) Weights over 50 lbs. will be accepted for testing or standardization provided the need is critical and the service is not available elsewhere. (Testing is to determine an apparent mass value with reference to Normal Brass with an uncertainty suitable for general usage, and to determine compliance or noncompliance with recognized specifications. Standardization includes testing and adjustment to comply with appropriate adjustment tolerance.)

(c) Packing and shipping:

(1) Arrangement for testing or calibration should be completed before weights are shipped to the Bureau. All correspondence must be addressed to the National Bureau of Standards, Mass and Volume Section, 212.31, Washington, D.C., 20234.

(2) Weights must be clean, suitably protected and shipped in wooden boxes with screw fastened covers or reusable crates. Adjustment cavity seals must be packed separately and included with all new weights shipped to the Bureau for standardization. The empty adjustment cavities must be suitably protected to exclude dirt and moisture while in transit.

(3) Ship weights as follows:

(i) The National Bureau of Standards provides three locations for calibration or testing of weights 50 lbs. and over. After notification, shipment should be made to the appropriate facility.

(ii) Test weights of 50 lbs. and reference standards of 51 lbs. to 1,000 lbs.: National Bureau of Standards, Boulder, Colo.

(iii) Test weights 50 lbs. and over, and reference standards 51 lbs. to 2,500 lbs.: National Bureau of Standards, Master Scale Depot, 5800 West 69th Street, Chicago, Ill.

(iv) Test weights and reference standards 50 lbs. to 50,000 lbs.: National Bureau of Standards, Building 202, Gaithersburg, Md.

(d) Adjusting material: When large amounts of adjusting material are required for new weights, the Bureau reserves the right to add the cost to the test fee or to require the owner or maker to furnish the material.

(e) Calibration, test, and standardization: For a calibration, the value of the weight or object, together with a statement of uncertainty, will be reported on an NBS Report of Calibration. Weights accepted for test will be reported as either complying or not complying with appropriate specifications on an NBS Report of Test. Weights accepted for standardization will be reported as complying with appropriate adjustment tolerance specifications on an NBS Report of Test. Fees in accordance with § 202.622 (a thru z) apply.

Item	Description	Fee
	Test weights, 50 lb, class C, cast iron	
202.622a	A handling fee of $4.00 per weight in addition to the applicable test fee will be charged for each weight of a group submitted; the minimum handling charge shall be	$24.00
	The Bureau no longer tests weights of this kind on a routine basis. Special need or requirement for this work must be established.	
202.622b	Tolerance testing (no adjustment), per weight	20.00
202.622c	Standardization, per weight	38.00
	Test Weights, 51 to 2500 lb.	
202.622d	Test and, when adjustable, standardize within Class C adjustment tolerances	60.00
	Cars, railway track scale test	
202.622e	Standardization on Master Track Scale at National Bureau of Standards Master Scale Depot, 5800 West 69th St., Chicago, Ill	49.00
	Test weights, 10,000 to 150,000 lb and all Reference Standards	
202.622z	Fees for tests of weights in this grouping will be charged dependent upon the nature of the test.	

§ 202.623 Calibration of mass elements of pressure-gage testing apparatus.

Calibration consists of cleaning, marking with suitable designation when required, and determining the value, which for weights of one pound and greater is reported to a precision of 1 part in 100,000. The fee is in accordance with fee schedule item 202.623a.

Item	Description	Fee
202.623a	Each item to be calibrated	$17.00

§ 202.624 Recalibration of mass standards.

Recalibration of reference mass standards should be based on monitoring the difference between weights or groups of weights in the set. As long as the differences as measured agree with the computed differences, the set can be considered constant. Mass standards submitted for recalibration will be cleaned, inspected, and tested by intercomparison. If this intercomparison shows there has not been a sufficient change to warrant complete recalibration, a letter so stating and referring to the previous National Bureau of Standards Report of Calibration will be issued. Such a letter may include new values for one or two weights if necessary. Fee will not exceed that listed under §§ 202.621, 202.622, or 202.623, whichever is applicable.

§ 202.625 Glass volumetric apparatus.

(a) Glass volumetric apparatus is tested generally by weighing the amount of distilled water contained or delivered with reference to the graduations marked on the instrument. The quality of the markings and the care exercised in reading or setting the liquid level are major factors in both calibration and usage. Occasionally such instruments are used as reference or transfer standards which require calibration. Many usage requirements are satisfied by testing for compliance with existing capacity tolerance specifications. The Mass and Volume Section offers both calibration and testing, subject to certain restrictions.

(b) Instruments suitable for, and to be used for, reference or transfer standards will be accepted for calibration. Such instruments must essentially conform to the specifications contained in NBS Circular 602, Testing of Glass Volumetric Apparatus. Acceptance for calibration is based on correspondence or consultation concerning the exact manner in which the instrument is to be used. If accepted for calibration, the instrument will be marked with an identification number, calibrated, and the results reported on an NBS Report of Calibration. The report will state the capacity under the conditions of test together with an associated statement concerning uncertainty. Fee for calibration will be computed on a cost basis.

(c) Precision grade glass volumetric apparatus will be accepted for testing to determine compliance with specifications and tolerances if the need is critical and the service is not available elsewhere. Acceptance for test is based on conformance with the specifications contained in NBS Circular 602, or other appropriate specifications. The item will be marked with an appropriate stamp if test results indicate conformity with NBS-approved specifications and tolerances. No individual report will be issued (see paragraph d below for exception). Fee for testing is in accordance with § 202.625 (a through l).

(d) A report will be furnished listing the test results for groups of blood pipets to be used as factory standards, if requested. Fees in accordance with § 202.625p.

Item	Description	Fee
	Testing in accordance with specifications in NBS Circular 602 or other approved specifications:	
202.625a	Flasks of capacities up to and including 250 ml, each	$7.00
202.625b	Flasks of capacities exceeding 250 ml, each	9.00
202.625c	Flasks marked both "to contain" and "to deliver", each	12.00
202.625d	Flasks, of any capacity, when bearing more than one graduation mark. Primary capacity, each	8.00
202.625e	Each capacity in addition to primary (number determined by the Bureau)	4.00
202.625f	Flasks, specific gravity, each	15.00
202.625g	Cylindrical graduates, capacities up to and including 250 ml, each	18.00
202.625h	Cylindrical graduates, capacities exceeding 250 ml, each	20.00
202.625i	Transfer pipets, each	7.00
202.625j	Burets, except automatic, each	21.00
202.625k	Burets, automatic, each	24.00
202.625l	Measuring pipets, each	17.00
202.625m	Items a through l disqualified for test on initial inspection, per item	7.00
202.625n	Dilution pipets, including Trenner automatic and Sahli, each	4.00
202.625o	Dilution pipets, automatic, other than Trenner, each	10.00
202.625p	Report of test for quality control purposes (applies to 202.625 n and o only), each item	4.00
202.625q	Apparatus n and o disqualified for test on initial inspection, each	4.00
202.625r	Items except those above for which there are accepted specifications, such as microazotometers, spirits measuring flasks, etc., will be tested on a cost basis in accordance with 202.625z. (Report of test will include capacities at test points if appropriate.)	
202.625z	For special calibrations not covered by the above schedule, fees will be determined on a cost basis.	

§ 202.626 Metal volumetric apparatus.

(a) Only those instruments suitable for use as reference standards (see, for example, specifications contained in NBS Monograph 62, Testing of Metal Volumetric Standards) will be accepted for calibration, based on inspection at the Bureau. Calibration consists of determining the value "to contain" or "to deliver" by either gravimetric means or by the use of transfer standards. The item will be marked, and the value determined will be reported, together with a statement concerning the uncertainty, on a National Bureau of Standards Report of Calibration. Fee in accordance with § 202.626 (a through z) applies. Specify "to contain," "to deliver," or both.

(b) Items not accepted for calibration as a result of initial inspection will be returned, fee in accordance with 202.6260 being applicable.

(c) Packing and shipping:

(1) The apparatus should be securely packed in cases or packages which will protect against possible damage.

(2) When submitting immersion bottles for calibration, do not include the tank as it is not used in the calibration.

(3) Arrangements for calibration of field standards in excess of 10 gal. capacity must be completed before shipping apparatus to the Bureau.

(4) If requested, the zero index or gage scales will be adjusted and sealed to within accepted tolerance specifications. Adjustment of slicker plate type standards should be made by the manufacturer.

Item	Description	Fee
	Calibration "to contain." Fee for calibration "to deliver" is same. For both calibrations, double fee shown.	
202.626a	Slicker plate measures of capacity less than 5 gal, each	$38.00
202.626b	Slicker plate measures of 5 gal capacity, each	49.00
	Adjustment of slicker plate measures to within accepted capacity tolerances, if requested, are done on a cost basis under 202.626z.	
202.626c	1/10 ft³ bottles for use in testing gas meters, each	49.00
202.626d	Cubic foot bottles for use in testing gas meters, each	71.00
202.626e	Portable cubic foot standards (Stillman type)	220.00
202.626f	Field standards of capacity less than 5 gal (graduated neck type), each	38.00
202.626g	Field standards of 5 gal capacity, each	49.00
202.626h	Field standards in excess of 5 gal but less than 50 gal capacity, first 10 gal increment	49.00
202.626i	Each additional 5 gal increment, field standards of 50 gal or more capacity	11.00
202.626j	First 50 gal increment	74.00
202.626k	Each additional 50 gal increment	13.00
202.626l	Each additional 5 gal increment	10.00
202.626m	Calibration of field standards, graduated neck type, at more than one scale point, each additional point	26.00
202.626n	Adjustment of zero index or gage, each	24.00
202.626o	Apparatus disqualified for test, inspection and handling, each	13.00
202.626z	For calibrations not covered by the above schedule, fees will be charged on a cost basis.	

§ 202.627 Hydrometers.

(a) Hydrometers are considered reference standards. Those instruments conforming with the recommendations on construction contained in NBS Circular 555, Testing of Hydrometers, will be accepted for calibration, acceptance based on inspection at the Bureau.

(b) For the purposes of this fee schedule, the following changes are made in Circular 555:

(1) Hydrometers with duplex scales or flat scales are not considered suitable for use as laboratory standards and will not be accepted for calibration.

(2) The thermometer element of a thermohydrometer will not be calibrated. (See ASTM Specification E100, Standard Specification for ASTM Hydrometers.)

(3) The results of calibration will be furnished together with a statement of uncertainty, on a National Bureau of Standards Report of Calibration. Use as a laboratory standard implies the use of corrections; therefore no reference to tolerance compliances will be made on the report.

(c) Calibration consists of comparison at three or more points with a standard hydrometer. Fee in accordance with § 202.627 applies.

(d) Apparatus not accepted for calibration will be returned, appropriate inspection and handling fee being applicable. Each scale card must state the name of the manufacturer and his serial number, the standard temperature and type of scale.

Item	Description	Fee
202.627a	Hydrometers, calibrated at three points, lots of 10 or more of identical scale range and design, each	$24.00
202.627b	Hydrometers, calibrated at three points, lots of less than 10, each of identical range and design, each	28.00
202.627c	Calibration at additional points, each point	7.00
202.627d	Hydrometers disqualified for calibration, inspection and handling charge	7.00
202.627z	For special calibrations not covered by the above schedule, fees will be determined on a cost basis.	

§ 202.628 Density determinations of solids and liquids.

(a) If the need is critical and the service is not available elsewhere, request may be accepted for the following density determinations.

(1) Density of solids, determined by hydrostatic weighing in appropriate liquid. Solids generally to have a mass less than 175 g and a maximum dimension less than 15 cm.

(2) Density of liquids, determined by weighing in picnometers at temperatures between 0 and 70° C.

(3) Associated tests such as the volume of solids, coefficient of thermal expansion for both solids and liquids.

(b) Acceptance for test is based on consultation or correspondence regarding the exact nature of the requirements. Do not ship materials to the Bureau until all arrangements for test have been completed. Fees for all tests are computed on a cost basis.

Item	Description	Fee
202.628z	Density determinations for solids and liquids, fee computed on a cost basis.	

A. V. ASTIN,
Director.

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